SECTION 2: Greenhouse Gas Emissions in Cambridge

GHG Emissions Inventory

The City has inventoried GHG emissions for the years 1990 and 1998 and forecasted emissions in 2010. The inventory focuses on carbon dioxide and methane. Significant sources of other greenhouse gases are not present in Cambridge.

Carbon dioxide results from the combustion of fossil fuels—oil, coal, natural gas, gasoline, and diesel. Methane results from the decomposition of organic waste-paper, food scraps, wood, etc.—in landfills. These fuels and materials are used in our daily activities at home and work. Burning oil and gas to heat our homes and workplaces, using electricity to power lights and machines, burning gasoline and diesel to run cars and trucks, and disposing of trash all result in the emission of greenhouse gases.

The GHG inventory is based on accepted international protocols and is the same approach other participants in Cities for Climate Protection use. The inventory is not meant to be a precise accounting, but it does provide a broad-brush examination of our GHG emissions and helps point out where actions are most needed. It does not include the emissions related to the production of most goods bought or consumed in Cambridge; these emissions would be included in inventories done by the communities in which the goods were made.

GHG Emissions in Cambridge

The GHG emission inventory and forecast are summarized in Table 2.1. The inventory indicates that annual GHG emissions rose between 1990 and 1998 and will likely continue to increase until the year 2010 unless action is taken to counter the trend.

In the commercial (businesses, institutions, and government) and industrial sectors, which were combined for the purposes of this inventory, electricity use was the major contributor of GHG emissions. Commercial energy use as a whole accounted for 61% of GHG emissions in Cambridge in 1998. In the residential sector, the use of natural gas (used primarily for home heating, water heating, and gas ranges) and fuel oil account for most of the emissions, although electricity is a significant contributor at over a quarter of the residential emissions. In the transportation sector, driving personal vehicles dominates emissions.

About GHG Numbers in the Plan

In this plan, greehouse gases are primarily meant to include carbon dioxide and methane. Greenhouse gas quantities are expressed in tons of carbon dioxide. This includes the conversion of quantities of methane into equivalent quantities of carbon dioxide (methane is approximately 20 times more potent than carbon dioxide as a greenhouse gas).

GHG Emissions Summary *Table 2.1*

Tons of CO_2		1990	1998	2010
Residential				
– Electricity		112,631	117,624	135,586
– Natural gas		236,505	213,275	321,646
– Fuel oil		133,049	108,734	133,049
	Subtotal	482,185	439,633	590,281
Commercial/Industrial				
– Electricity		799,879	843,975	985,120
– Natural gas		146,064	179,524	195,726
– Fuel oil		36,690	37,433	36,690
	Subtotal	982,633	1,060,931	1,217,535
Transportation				
Rail				
– Diesel		711	711	824
– Electricty		4,367	4,065	4,691
Road				
– Gasoline		182,104	193,966	211,240
– Diesel		21,981	23,332	25,498
– Electricity		1,359	1,265	1,460
	Subtotal	210,522	223,339	243,714
Waste		24,039	9,999	26,923
	TOTALS	1,699,378	1,733,902	2,078,454

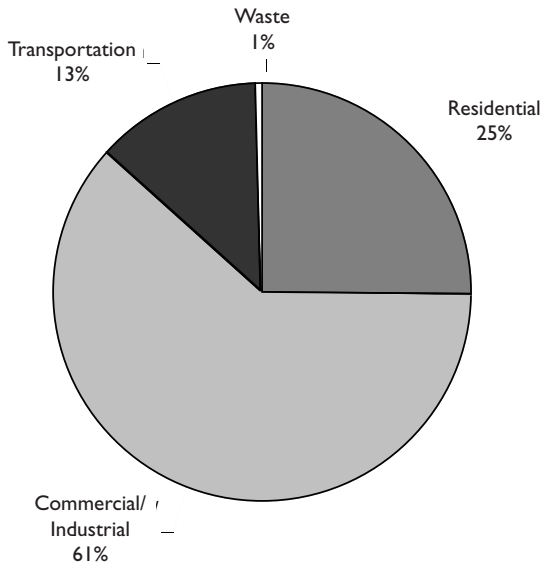
Comparisons

Comparing Cambridge's GHG emissions to those of other communities can provide some sense of how high our emissions are. Communities vary greatly in population, income levels, mix of economic activities, and land use patterns—all of which influence the rate of emissions.

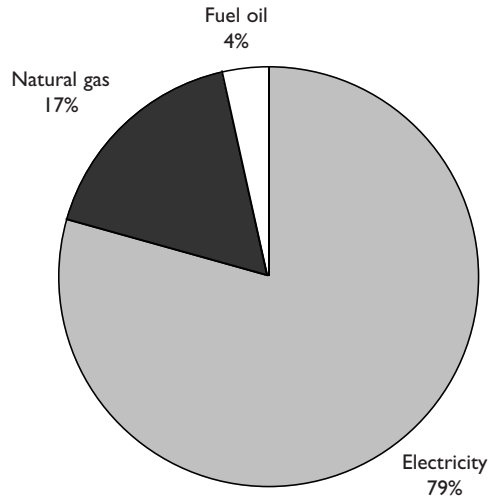
Compared to the national average, Cambridge's emissions are relatively low. Cambridge has a natural advantage in its small geographic area, dense land use pattern, large stock of multifamily housing, and availability of public transit.

However, compared to other countries, Cambridge's emissions are high. This is generally true of all American communities. The United States, with only about 5% of the world's population, emits about a quarter of all greenhouse gases; we are the single largest source of emissions.

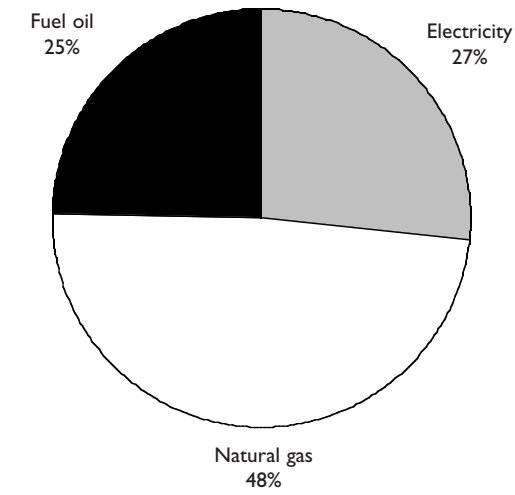
1998 Cambridge Greenhouse Gas Emissions



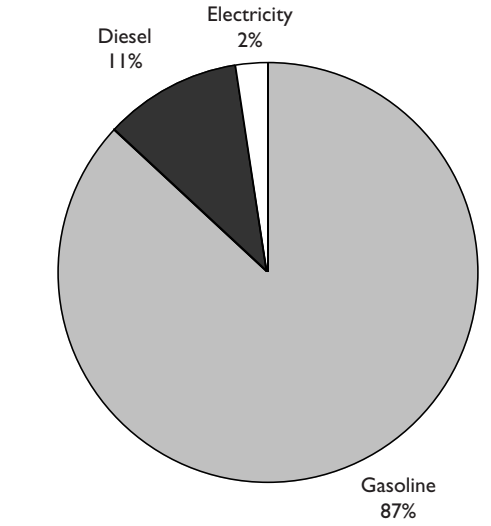
Commercial/Industrial GHG Emissions by Energy



1998 Residential GHG Emissions by Energy



Transportation GHG Emissions by Energy



Comparison of 1990 GHG Emissions ***Table 2.2***

City	Population	Total Emissions *(Tons CO_2)*	Per Capita Emissions *(Tons/person)*
Cambridge	*95,802*	*1,699,378*	*17.7*
Burlington, VT	39,127	438,931	11.2
Fort Collins, CO	87,758	1,673,861	19.1
Newton, MA	82,585	1,973,540	23.9
Santa Fe, NM	55,859	1,418,819	25.4
Santa Cruz, CA	54,575	747,679	13.7

Emissions Inventory and the Plan

The inventory shows that in order to reduce GHG emissions, Cambridge needs to address building energy use, particularly among businesses, institutions, and government. This need reflects the mix of activities that is present in the city. In comparison, a "bedroom community" with primarily residential land uses would conclude that action needs to focus on household energy use and transportation.

Section 4 of this plan discusses in detail how energy use contributes to GHG emissions, lists the resources and programs available to support actions, and describes past, present, and future actions that can be taken to reduce emissions. Table 2.3 lists energy consumption associated with the use of different types of appliances and devices. The table shows that consumers can make choices that affect how much greenhouse gas their activities emit. For example, replacing one 60-watt incandescent light bulb with a 15-watt compact fluorescent light bulb that provides the same amount of light while using less electricity saves 85 pounds of carbon dioxide in a year.

The inventory can be used as a baseline to track progress in meeting the plan's goals. It is recommended that the City conduct inventories on a regular basis to evaluate the results of Cambridge's efforts to reduce GHG emissions.

Energy Use in the Home *Table 2.3*

Device/Appliance	Wattage *(watts)*	Annual Electricity Use *(kilowatt-hours)*	CO_2 Emissions *(pounds)*
Lighting (4 hours a day)			
Incandescent light bulb	60	84	119
Energy Star compact fluorescent light *(same output as 60 watt incandescent bulb)*	15	24	34
Halogen torchiere floor lamp	300	432	613
Energy Star compact fluorescent floor lamp	58	84	119
Appliances			
Refrigerator/freezer 17.5 cubic ft., frostless	757	2,256	3,203
Energy Star Refrigerator/freezer 17.5 cubic ft., frostless	551	1,572	2,232
Dishwasher, heated dry	1,200	264	374
Energy Star Dishwasher, heated dry	1,200	132	187
Washing machine Hot wash w/electric hot water	512	540	766
Energy Star washing machine, hot wash w/electric hot water	259	276	391
Central air conditioner *(4 months of use)*	5,000	1,620	2,300
Room air conditioner *(4 months of use)*	1,500	804	1,141
Ceiling fan *(4 months of use)*	100	120	170
Electronics			
Color television	155	420	596
Home computer	150	240	340
Laser jet printer	500	60	85